



ReliaPad™
Dead-front padmount circuit breaker
15–27 kV

Power and productivity
for a better world™



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Introduction

Overview

ABB strives to bring our customers the latest technology. Combined with superior performance, innovative design, and exceptional service aimed at total customer satisfaction, ABB's ReliaPad padmount breaker is the natural choice for you.

The ABB ReliaPad Padmount Circuit breaker is truly the next generation in medium voltage Underground Electrical Distribution Systems Protection. Modular manufacturing techniques incorporate ABB's vacuum interrupters operated by magnetic actuation technology to offer the most reliable and automated operation for underground distribution systems.

The ABB ReliaPad has four main components:

- High voltage compartment
- Low voltage control cabinet
- Potential transformer with PT fuse
- Load-break switch - optional

Two options

- Standard enclosure: three-phase circuit breaker, low voltage control cabinet, MV switches, and potential transformer
- Compact enclosure: three-phase circuit breaker, low voltage control cabinet, and potential transformer

Features

- Dead-front design
- Double load break switches providing visual break for incoming and outgoing feeders are available
- Three phase and single phase operation is available.
- Protection relay included
 - Overcurrent Protection
 - Over/Under Voltage Protection
 - Programming Inputs and Outputs
 - Voltage and current measurements
 - Communication ready
- Reclosing function included
- Sectionalizer mode included
- Magnetic actuators provide 10,000 mechanical/load operations
 - Less moving parts = less maintenance
 - No mechanically charged components for added safety
- Virtually no maintenance in the high voltage compartment
- For reliable operation, all the electronics are located in the control cabinet
- No need to access high voltage compartment for electronics access
- Two control cabinet sizes:
 - Low Profile: small and discrete cabinet
 - Large cabinet: Ideal for adding communication devices
- HCEP (Hydrophobic Cycloaliphatic Epoxy) insulation material for the breaker poles
 - No oil or gas insulation = reduced environmental impact

Application

- Besides single or three phase tripping and fault handling capabilities, the ReliaPad delivers automation for underground electrical distribution systems
- Main Breaker for distribution and small power transformers:
 - They can be used up to 14 MVA on 13.8 kV or 26 MVA on 24.9 kV Power transformer incoming breaker
- Zone Sequence Coordination:
 - In power systems, protection schemes include series combinations of circuit breakers on medium voltage distribution radial feeder lines
 - The PCD/RER620 relays with multiple time curves and time dials are available for the Phase time overcurrent, Ground time overcurrent, Phase Instantaneous overcurrent, Ground instantaneous overcurrent, and Negative Sequence time overcurrent protection
 - A User Programmable curve option is also available, allowing the user to create custom time current curves for more enhanced coordination than the standard curve types provide
- Padmount substation solutions where traditional substation is not applicable

Technology review

ReliaPad technology

As part of ABB's initiative to stay a generation ahead, ABB has combined the latest magnetic actuation technology, highest quality vacuum interrupters, and most durable components into the most dependable solution in padmount circuit breaker for underground distribution systems.

High voltage cabinet assembly

Vacuum Interrupters

ABB has been developing and manufacturing vacuum interrupters since the early 1980s. Worldwide, more than two million ABB vacuum interrupters are in service. ABB's vacuum interrupter uses the latest technologies in high quality mass production to produce the next generation of vacuum interrupters. This new generation of vacuum interrupters is robust for universal application.

Vacuum technology fits very well with circuit breaker requirements since it can easily handle frequent operations. Additionally, vacuum interrupters do not need any extra time to recover.

Advantages

- Maximum reliability
- Superior contact wear
- Long life: 10,000 full load operations
- Maintenance free for life
- Environmentally friendly

Vacuum interrupters



Pole assembly

ABB combines vacuum interrupter technology, embedded voltage, and current sensors. HCEP insulation material properties to create a superior pole design. Embedded current transformers are used to measure current flowing through the interrupting device. The current transformers have 600:1A ratio and are designed to not saturate until maximum fault condition of the circuit breaker.

Capacitor Voltage Divider sensors (CVD) are used to measure voltage of the high voltage line. CVD is primarily used for voltage magnitude measurement with a standard accuracy.

Advantages

- Maintenance free: tested to 10,000 full load operations
- Few moving parts
- Embedded CT and CVD deliver the best compact solution
- The pole insulating material is Hydrophobic Cycloaliphatic which increases reliability by minimizing the risk of insulation flashover. Furthermore, reducing discharge activity translates into decreased insulator erosion and increased insulator life expectancy.

Magnetic actuators

ABB designed a simple, magnetically actuated operating mechanism that operates 10,000 times with a couple moving parts, unlike ordinary spring charged mechanisms. The ABB magnetic actuators are resistant to corrosion using stainless steel shafts as linkage to the vacuum interrupter pull rods.

Bi-stable operation was added to allow ABB circuit breakers to remain in open or closed position, even when power is lost. The ABB circuit breaker is equipped with one magnetic actuator per phase to allow single-phase tripping, increasing the reliability of the feeders it serves, besides eliminating complicated mechanism linkages. The result is a friendly field serviceable unit, where poles can be easily changed. ABB knowledge in magnetic actuation technology, leads the way for the new generation of circuit breakers.

Advantages

- 10,000 full load operations
- No lubrication, maintenance, or adjustments
- Simple design
- Bi-stable - no power required to hold breaker position
- Single phase tripping capability
- Friendly to field service



Pole assembly



Single-phase magnetic actuator

ReliaPad offers two control options

PCD & control cabinet

Human Machine Interface (HMI)

The PCD HMI (Human Machine Interface) directly allows programming, interrogation and control of the circuit breaker, and contains the following elements:

Status-Indication LED Targets

- Pickup
- Phase O/C
- Ground O/C
- Lockout
- Self check
- USER 1 and USER 2

Control buttons with LED targets

- Remote blocked
- Ground blocked
- Reclose blocked
- Alternate 1 settings
- SEF blocked
- Counters PROG 1 (battery test)
- PROG 2 (phase select)

Breaker status LED and direct controls

- Close pushbutton
- Open pushbutton
- Circuit breaker Position LED
- Hot line tag
- LCD
- Enter key
- Left and right arrow keys
- Up and down arrow keys
- Clear key
- PCD system reset
- RS-232 serial front port

Communication & I/O ports

- Isolated RS-232 and RS-485 ports
- ST fiber optic ports
- Programmable I/O ports: 6 inputs, 4 outputs available with UPS
- Modbus ASCII and RTU, and DNP 3.0TM protocols included with all units

Single-phase tripping (optional)

- Reduces unnecessary three-phase interruptions and outages due to single-phase faults
- Single-phase tripping options of only picked up phases (OPUP) or one or all phases (OOAP)
- Reclosing function available with possibility to adjust each step of reclose sequence. Each sequence can be adjusted to operate single or three phase or lockout

Metering

- Meters current and voltage
- Current sequence components: Magnitude and phase angle
- The minimum and maximum meter measures for phase and ground current
- Positive sequence, negative sequence, and zero sequence currents
- All data can be downloaded on-site or remotely through communications interface

Protective functions

- Phase time overcurrent protection (ANSI 51P)
- Phase instantaneous overcurrent protection (ANSI 50P-1)
- Two definite time overcurrent settings (ANSI 50P-2, 50P-3)
- Ground time overcurrent protection (ANSI 51N)
- Ground instantaneous overcurrent protection (ANSI 50N-1)
- Two definite time ground overcurrent settings (ANSI 50N-2, 50N-3)
- Sensitive earth-fault (SEF)
- Negative sequence time overcurrent protection (ANSI 46)
- Up to four reclose cycles (define a circuit breaker cycle ANSI 79-1 → 79-5) close four times / trip five
- Adaptive reclosing shots: each reclose sequence allows independent

Programming of protective functions

- Available with up to 42 recloser curves, 9 ANSI curves, 5 IEC curves, and 3 user programmable curves
- Cold load pick-up

Control cabinets

- Choose from standard cabinet or low profile control cabinet (LPCC)
- Standard option with large cabinet with ample space for mounting communications equipment
- Three-point latching with padlockable handle
- Vented design
- Ground fault receptacle provides AC power for a laptop

1 PCD relay | 2 PCD & standard LV control cabinet | 3 PCD & low profile LV control cabinet



RER620 & control cabinet

The RER620 and its control cabinet are one of the most advanced distribution controllers with IEC61850 protocol. The RER620 controller is ideal for Distributed Generation (DG) and fast transfer switching schemes. Its capability of inrush current detection, high impedance fault handling (HIZ), integrated loop scheme, and full IEC61850 compatibility makes it the most advanced distribution system controller.

Local Human Machine Interface (LHMI)

The LHMI with the open and close buttons when the IED is set to local control mode (R/L button), The LHMI contains the following elements:

Display (LCD)

Programmable push buttons

ESC button

Hot keys

Control: OPEN/CLOSE and status

Three dedicated LEDs: Normal, Pickup, and Trip

11 programmable LEDs

ENTER button

CLEAR button

RJ45 port

MENU button

HELP button

LOCAL/REMOTE button

Authorization button

Navigation buttons

Communication & I/O ports

- Configurable RS-232/RS-485 ports
- RJ45
- ST fiber optic ports
- Programmable I/O ports: 4 inputs, 6 outputs standards
- DNP3 TCP/IP and serial, IEC 60870-5-101,104, Modbus TCP/IP and RTU/ ASCII are available

Single-phase tripping

This feature allows an electric utility to prevent unnecessary three-phase interruptions and outages where thereby improving the overall power system reliability and quantity of power delivered to customers.

Metering

- Meters current and voltage
- Current sequence components: magnitude and phase angle
- The minimum and maximum meter measures for phase and ground current
- Positive sequence, negative sequence, and zero sequence currents
- All data can be downloaded on-site or remotely through communications interface

Protective functions

- Phase time overcurrent protection, low stage (ANSI 51P)
- Phase time overcurrent protection, high stage, instance 1&2 (ANSI 50P-1,50P-2)
- Phase instantaneous overcurrent protection (ANSI 50P-3)
- Ground time overcurrent protection, low stage (ANSI 51N)
- Ground time overcurrent protection, high stage, instance 1&2 (ANSI 50N-1,50N-2)
- Ground Instantaneous overcurrent protection (ANSI 50N-3)
- Sensitive earth-fault (SEF)
- Negative sequence time overcurrent protection, instance 1 & 2 (ANSI 46-1, 46-2)
- Phase discontinuity protection
- Three-phase inrush detector
- Circuit breaker failure protection (ANSI 50BF)
- Autoreclosing (ANSI 79)

Control cabinets

- Choose from standard cabinet or low profile control cabinet (LPCC)
- Ample space for mounting communications equipment
- Draw out relay design easy to replace in the field
- Three-point latching with padlockable handle
- Vented design
- Ground fault receptacle provides AC power for a laptop

1 RER620 & standard control cabinet | 2 RER620 & low profile control cabin | 3 RER620 relay

1



2



3



Load break switch

The ReliaPad uses the best in class loadbreak switch - ABB VersaRupter. The basic unit consists of a heavy-duty frame with stand-off insulators, a snap action operating mechanism which is mounted on the frame, and current carrying parts including blade-type interrupters with cast hinges and jaw connectors.

The switch interrupts 600 A load current, and it meets the requirements of ANSI No. C37.20.4.

The usage of the VersaRupters in the ReliaPad circuit breaker delivers the following features:

- Complete isolation of the circuit breaker high voltage compartment
- Visual break for both sides – incoming and outgoing feeders
- Safety: Tag and padlocking the unit under operation

Advantages

- Air blast technology for arc extinction
- 100 full load operations
- 1000 mechanical operations
- Enhanced phase spacing to reduce potential for flashover

Options:

Two VersaRupters for load breaking from incoming and outgoing feeder.

Potential transformer

The integrated potential transformer provides the control power for all of the electrical components installed on the ReliaPad circuit breaker.

ABB voltage transformer is designed for line to ground circuits. The single centered bushing and reduced neutral end insulation permits a significant reduction in size and installation spacing, while maintaining full insulation clearances.

The primary and secondary coils are wound using special winding and shielding techniques for improved voltage stress distribution. Each coil is carefully insulated with Mylar film to provide a high dielectric medium between layers.

Advantages

- Outdoor VT meets all applicable IEEE and NEMA standards
- 120 V secondary voltage, 60 Hertz
- Thermal rating: 750 & 1000 VA @ 30°C ambient
- Cast in hydrophobic cycloaliphatic epoxy (HCEP) for insulation

1 Potential transformer | 2 VersaRupter switch

1



2



PT fuse for ReliaPad with two VersaRupter switches

The fuse is provided to protect the high voltage system and it is easy to replace.

The ReliaPad fuse is designed to easily be replaced in the field. A fuse access door is located at the back of the ReliaPad padmount circuit breaker. The PT door mechanism allows the operator to open the door and remove the fuse. Hinged phase barriers secure high voltage compartment when fuse access door is in the service position.

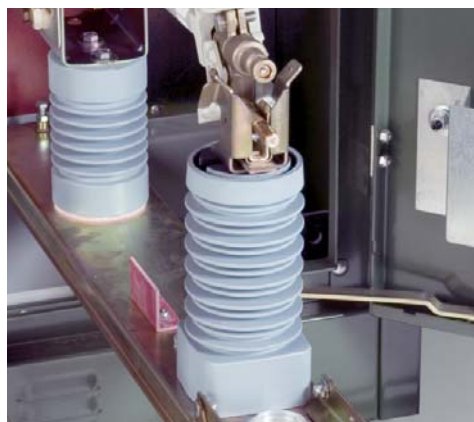
Advantages

- Meets the ANSI Standard C37.47-1981, minimum melting time-current characteristic curves
- Utilizes an industry standard fuse and end fitting
- Mechanical disconnection from live parts when the fuse door is open

PT fuse for ReliaPad without VersaRupter switches

The fuse is provided to protect the high voltage system and it is a fuse live switching. The ReliaPad fuse is designed to be replaced in the field. A fuse access door is located at the back of the ReliaPad padmount circuit breaker.

Fuse for ReliaPad with two VersaRupter



ReliaPad potential transformer



ReliaPad fuse door



Product review

ABB ReliaPad padmount circuit breaker

The ReliaPad padmount circuit breaker has all the same great features offered by ABB OVR or Gridshield reclosers. The ABB ReliaPad meets present circuit breaker demands, plus offers advanced capabilities such as adaptive protection, control, monitoring, communications, and single-phase tripping for tomorrow's needs.

Benefits

- The ABB ReliaPad is dead-front padmount switchgear where all energized parts are completely enclosed within a grounded steel compartment.
- Terminations in the switch compartment are 600A bushings, suitable for dead-break elbow connectors
- The PT fuse is accessible only when the fuse access door has been unlatched and pivoted to the open “service” position for ReliaPad using two VersaRupters switches
- PT fuse live switching is only available on the ReliaPad without VersaRupters.
- Key interlock available for switches and PT fuse compartment
- Construction and coating meet or exceed ANSI standards for padmounted equipment enclosure integrity stated in IEEE/ANSI C57.28.12
- Mild steel is the standard offer for the enclosure and stainless steel is optional
- No electronics in high voltage compartment protects controls from thermal overload and reduces maintenance costs
- Simple-to-operate controller with clear open/close push buttons
- Human machine interface (HMI) from ABB relays allows direct access to system currents, circuit breaker status and settings
- Communication equipment fits right into control cabinet
- 24/7 dependable customer support

Technical data

Nominal operating voltage:	14.4	24.9	kV
Rated Maximum voltage:	15.5	27	kV
Rated power frequency:	50/60	50/60	Hz
Rated continuous current:	600	600	A
Rated symmetrical interrupting current:	12.5	12.5	kA
Rated lightning impulse withstand (BIL):	95	125	kV
Power-frequency withstand voltage test design	35	60	kV
Power-frequency withstand voltage production test	34	40	kV
Max. interrupting time:	0.03	0.03	sec max
Max. closing time:	0.055	0.055	sec max
Current sensors:	One per phase encapsulated into the pole		
Voltage sensor:	One per phase encapsulated into the pole		
The recloser has been tested to meet the IEEE C37.60 2003, and padmounted standard IEEE C37.74 & C57.12.28			
Temperature:	-50° to 70°*		
Humidity:	Per ANSI C37.90, up to 95% without condensation**		
Dimensional information:	99.5" (W) x 82"(D) x 51" (H)		
Weight:	3300 lbs		

*Technical data only for the recloser

**PCD or RER620 relay rating

ReliaPad ordering guide

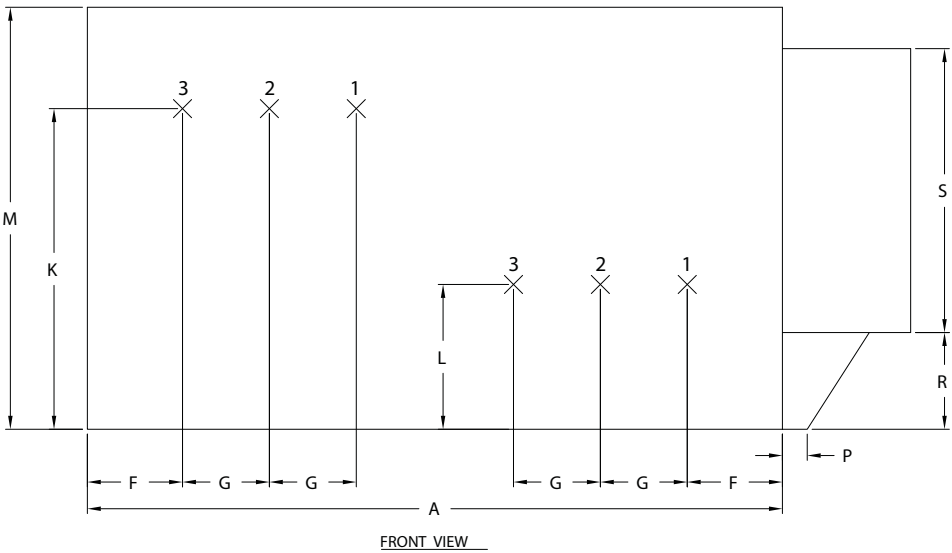
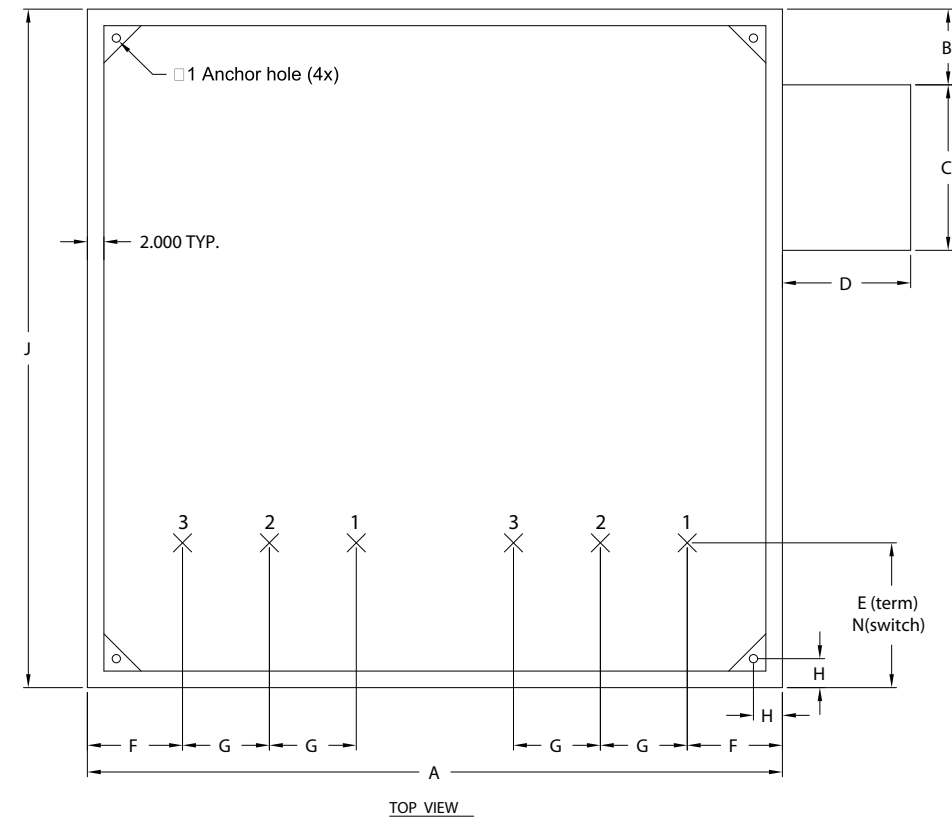
Digit		Description
1)	P	P: Padmounted
2)	R	R: Recloser
3) Voltage & BIL (kV)	1	1: 15 kV - BIL 95 kV - 600A 2: 27 kV - BIL 125 kV - 600A 3: 38 kV - BIL 150 kV - 600A (Future)
4) Interrupting Rating (kA)	1	1: 12.5KA 2: 16 KA (Future)
5) Model Type	2	2: Two 600A switches (standard enclosure) N: Without 600A switches (compact enclosure)
6) PT Control	1	1: PT + 6A fuse + end fitting N: None
7) PT Ratio	1	1: 7200/12470 GY, type VOG-11 PT 2: 7620/13200 GY, type VOG-11 PT 3: 8400/14560 GY, type VOG-11 PT 4: 14400/24940 GY, type VOG-12 PT 5: 19920/34500 GY, type VOY-20G (Future) Z: Special PT N: None, if PT is not provided
8) Recloser Control	O	G: ABB GridShield with RER620 O: ABB OVR with PCD
9) Control Power Supply	A	1: RER620 with UPS (Input Voltage:100V-200V) DC/AC with 120VAC Heater 3: RER620 with UPS (Input Voltage:200V-250V) DC/AC with 240VAC Heater A: PCD with 120/240 VAC (90-250VAC/ 125 VDC) for 15/27kV recloser B: PCD with 120/240 VAC (90-250VAC/ 125 VDC) for 38kV recloser

ReliaPad ordering guide (continued)

Digit		Description
10) Binary I/O	B	1: RER620 with 4 BI (Binary Input) + 6 BO (Binary Output) 2: RER620 with 12 BI (Binary Input) + 10 BO (Binary Output) A: PCD without Binary inputs, Binary outputs, or Alarms for 15/27kV recloser B: PCD with 6 BI (Binary Input) + 4 BO (Binary Output) for 15/27kV recloser C: PCD without Binary inputs, Binary outputs, or Alarms for 38kV recloser D: PCD with 6 BI (Binary Input) + 4 BO (Binary Output) for 38kV recloser
11) Control & Faceplate Options	1	E: RER620 with ANSI Standard F: RER620 with ANSI Standard, Single Phase Tripping 3: PCD with ANSI Standard, front RS-232 port, Large LCD screen, integral tagging functions. include Firmware, & prog Curves 1: PCD with ANSI Standard, Include option 3 and adds single-phase tripping
12) Communication Ports and Protocol	B	3: RER620 with Two ports: Ethernet 10/100BaseT (RJ45) + configurable RS232/RS485 4: RER620 with Three ports: Ethernet 10/100BaseT (RJ45) + configurable RS232/RS485 + [RS485 or serial glass fiber (ST)] A: PCD without Com module (RS-232 on CPU only) B: PCD with Com 2a Module (RS-232 & RS-485; Fiber)
13) Recloser LV Cabinet Option	L	L: Large (standard) S: Low profile (Limited space for additional devices)
14) Bushing	S	S: 600A Bushing (standard) 2: 200A Bushing wells (Future)
15) Paint	S	S : Green (Guardian Green Munsell 7GY3.29/1.5) (standard) G: Gray (ANSI-70) T: Tan (Munsell 10YR6.0/3.0) Z: Special Paint Color
16) Standard Dynamic Accessories	N	B: Transfer switch to transfer control power from primary to secondary source (PT control and 120VAC customer supply must be available) D: Current test switch N: No accessories required
17-18) Dynamic Accessories- Specific to unit will change last two digits of style number	00	Radio Package Adapter/Extension providing 6 inches of additional termination height (only for two switches model) Key Interlock to prevent opening fuse door unless all switches are locked open (only for two switches model)

Dimensional drawings

	A	B	C	D	E	F	G	H	J	K	L	M	N	P
ReliaPad 15/27KV	84	9.15	20	15.5	N / A	11.5	10.5	3.5	82	38.75	13.5	51	17.5	3.5



Accessories

Communications packages

Besides the communication protocols listed below, assembled brackets for radios or communication devices can be installed at ABB factory (optional).

PCD supported protocols include:

- DNP 3.0 Level 2
- MODBUS ASCII
- MODBUS RTU
- IEC 60870-5-101

RER620 supported protocols include:

- IEC 61850
- DNP3 over LAN/WAN
- DNP3, RS485
- MODBUS RTU/ASCII
- MODBUS TCP/IP

Transfer switch

Quickly transfer control power between the primary and secondary source (PT control and 120VAC customer supply must be available)

Recloser simulator card

Test out relay schemes or verify the operational integrity of a PCD controller or RER620 with a ABB recloser simulator card

- Test relay schemes
- Simulate fault conditions
- Plug and play
- Inject secondary currents
- Easy, cost effective method for testing relay schemes and the operational health of a PCD or RER620, without operating the circuit breaker

Flexitest switch

- Perform secondary current Injection directly into the PCD or RER620 (FT-1 option allows easy access for tests using secondary current injection with virtually any type of test equipment)
- Use the FT-1 to test the health of current transformer
- No need to disconnect the control cable, and terminal blocks

1 Recloser simulator card | 2 Flexitest switch | 3 Transfer switch

1



2



3



Service & support

ReliaPad customer support

- Free 24-7 technical support line 1-800-929-7947 ext. 5 or international +1-407-732-2000 ext. 5
- Feeder Automation Users website featuring news, FAQs, discussion board, technical information, product brochures, software downloads, contact information, instruction manuals, programming shortcuts, drawings
- Standard one year warranty

Training

- Factory based training: two-day training course designed for participants to become proficient in application, installation, operation, maintenance, testing, and commissioning of PCD or RER620 relays and Padmount circuit breakers
- Multi-track, on-site field training available
- PCD & RER620 training aids with simulators includes a PCD or RER620 with a simulator card and enables tabletop practice and simulation of the relays

Notes

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